Leak Prevention

Tanks Down East

by W. David McCaskill

David McCaskill is an Environmental Engineer with the Maine Department of Environmental Protection. ***Tanks Down East*** *is a regular feature of* LUSTLine. *As always, we welcome our readers' comments.*

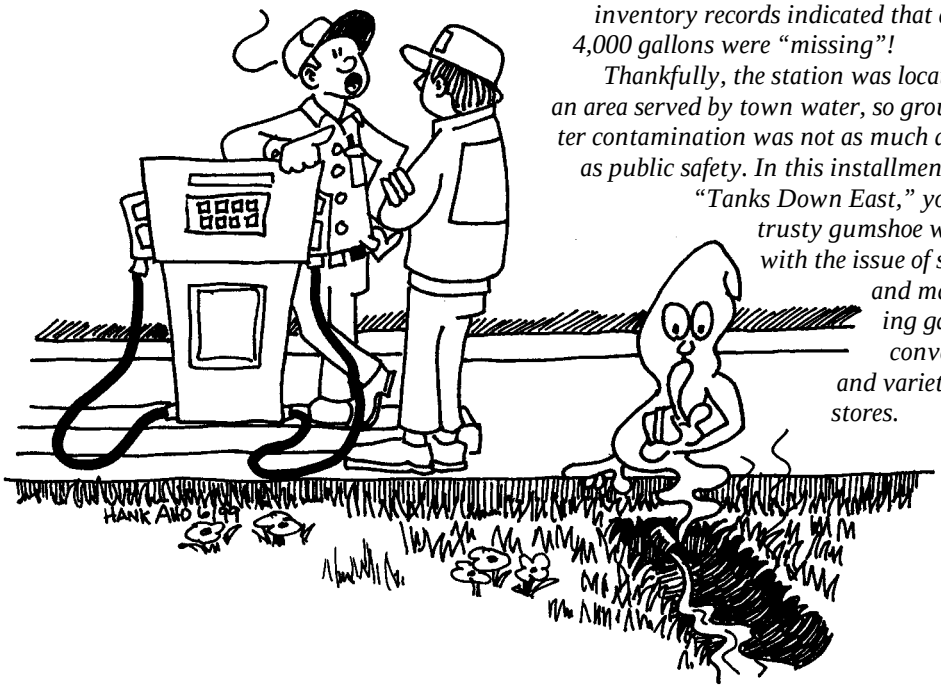
Convenience Is Nice, But UST Systems Aren't Potato Chips

Life sure seems busy! During the week, we're busy filing into our local, super convenience store, fueling our car with gasoline and ourselves with designer coffee and gourmet danishes. On the weekend, we spend time driving our gritty, salt-sprayed, progeny-packed SUV back to the local convenience store to retrieve that showroom shine at the high-tech, brushless car wash. Then when we need our 3,000-mile oil and lube, we head right back to that very same convenience store. Yep, there's a lot going on at your typical, modern, co-branded convenience store. And just as we customers like our conveniences, so do tank owners and operators.

I'm thinking of one local convenience store just off I-95 and right down the road from a certain high-customer-traffic outlet town known for its rubber-bottom boots. The store has a high-throughput, highly pressurized fueling system that is just as high-tech as the coffee and the carwash. It's got double-walled tanks and piping, continuous interstitial-space monitoring, automatic tank gauges, line leak detectors—the works. The system is so well endowed, you'd think it could handle all its own affairs and make its own coffee to boot. But that's where we often fail our UST systems—we depend on them to do too much all by themselves.

Last March, the owner of this Maine facility got a major jolt that no high-test designer coffee could induce—raw gas came gurgling out of the adjacent storm drains! The troops, including the town fire brigade, a Maine Department of Environmental Protection (MDEP) responder, and the cleanup contractor with his ever-ready industrial-strength vacuum cleaner, were dispatched to the site. Over the course of two weeks, about 3,000 gallons of gasoline and water were recovered, but inventory records indicated that around 4,000 gallons were "missing"!

And now, thanks to my double-walled tanks and piping and my sophisticated leak detection system–I don't have to worry!!



Thankfully, the station was located in an area served by town water, so groundwater contamination was not as much an issue as public safety. In this installment of "Tanks Down East," your trusty gumshoe will deal with the issue of siting and maintaining gasoline convenience and variety stores.

The Murky Details

So how the heck did 4,000 gallons slip through the multiple defenses of this very model of a modern storage system? Well, as with many such cases, it was the combination of cascading equipment failure combined with faulty follow-up.

This UST system consisted of double-walled fiberglass tanks and pressurized double-walled piping. In this type of piping system, the product is moved from the tank to the dispenser and nozzles by a submersible pump inside the tank. The product is sucked out of the tank by the pump to a manifold that sits on top of the tank, where it is then pushed up through the piping.

In this installation, the submersible pump manifold, which contains electrical connections to the motor and plumbing to the piping, is housed in the containment sump so that any leaks from the pump or piping can be contained and monitored. The sump itself is attached to the tank opening via a pressure plate and rubber gaskets.

This piping system is monitored for leaks in two ways. The first is a line leak detector—a device used to monitor for catastrophic piping leaks (i.e., three gallons per hour or more) and located, in most cases, in a port on the submersible pump manifold. The line leak detector will only detect three gallon per hour leaks downstream of where it is installed.

Second, smaller leaks are detected by leak detection sensors, which are located near the bottom of the containment sump. Most of these probes are micro float switches,

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which, when immersed in liquid, make an electrical contact, sending an alarm to the control box.

The stage is set, so now let's see how this chain reaction got started and what kept it going.

On March 10, a contractor was called to investigate a customer complaint about a low-flow condition at the dispenser nozzles. Gasoline was found dribbling out of the pump manifold, and about one-half gallon had pooled in the bottom of the sump. The pump manifold was opened and fibers from an ingested sorbant pad were found to be restricting the flow. A failed gasket was replaced, and product was removed from the sump.

On March 11, the gasoline gurgled out of the storm drain and the troops arrived.

On March 12, the contractor was called back to the site to test the product line for the unleaded tank, which was found to be tight; however, when the containment sump was tested by filling it with water, all the water leaked out. Further investigation found that the gasket at the bottom of the sump was torn and had allowed product to leak out.

Later, a review of the electronic alarm history by the MDEP showed sump alarms on December 21, 1998, January 3, 1999, and March 3, 1999. The owner stated that the first two alarms were the result of water infiltrating through the sump covers during a storm event (rain). Each time the alarm sounded, the manager had removed about two inches of water from the sumps. The owner stated that the manager was not aware of the March alarm.

A review of the inventory showed a loss of around 4,000 gallons of gasoline from March 3 to March 11.

Vigilance Matters

What could have been done to prevent this problem? It boils down to maintenance and vigilance. The system, as a whole—pump, line leak detector, containment sump—missed the boat, and someone didn't respond to the sump probe alarm (or at least not appropriately).

This UST system was literally screaming for help, but unfortunately the operator probably thought that it was crying "water in the sump" wolf. The clues to this catastrophe were all there, but no one person heeded them all or knew what they all meant. Someone needed to step back and put the whole thing together.

In the design of the storage system, the owner could have elected to install fiberglass sumps, which are bonded directly to the tank and thereby eliminate the reliance on a gasket. Also, I believe that all containment sumps should be tested annually for leaks by filling with them with water to see if any leaks out.

As for false alarms caused by "nuisance" water coming through fitting penetrations and sump covers, the industry has been striving to develop a totally liquid-tight sump and, for the most part, has...well, they're gettin' there. However, we still have to contend with retrofitting those older first- and second-generation sumps that remain.

Station owners need to be more vigilant in inspecting and responding to problems. Another long-time station owner who now teaches UST management courses told me of a similar event at his station some years ago. As in the first story, he had a pressurized piping system with containment sumps, line leak detectors, and leak detection float switches.

As a cagey, veteran service station owner, he recognized the folly of relying solely on the technology, so once a month he would open up his containment sumps to take a look-see. During one of these monthly walkovers, he found, much to his horror, a sump a couple of inches shy of being full of gasoline!

In this case, the leak occurred near the top bolts of the actual line leak detector; since it couldn't check itself, it never "saw" the leak. The sump leak detection floats were physically stuck in place and could not float up with the product and signal a leak.

Facility Siting Matters

The sites mentioned above were in areas where water supplies were not threatened. In the case of the station mentioned in *LUSTLine* Bulletin 31, "A Little Drop'll Do Ya," and Bulletin #30, "The Holes in Our UST Systems," a modern convenience store was allowed to be located within 1,000 feet of a water supply well field.

For whatever reasons, the town carved an area out of its mapped wellhead protection zone so that the station could be built. Within less than a year of operation, MTBE was found in low ppb concentrations in the water district's monitoring wells and production wells (7,000 ppb concentrations were found in the tank excavation area).

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The source of contamination was most likely several 10-gallon overfills, something that happens when fuel delivery truck drivers override the overfill prevention device. A driver may think he's filling a 10,000-gallon tank, but in reality, he is dealing with a 9,700-gallon tank. So, on occasion, he is stuck with a hose full of product. Because he has more in the truck compartment than the UST can hold, he empties the hose into the 3-gallon spill bucket and the rest spills over and seeps into the surrounding soil. Again, our fancy technologies will do little good if we don't fully understand how they work.

One year after responding to the MTBE problem at this site, perchloroethylene was detected in the monitoring wells and traced back to the store's septic tank and sink traps!

We don't know how or why perc was poured down the cleaning sink. The real lesson here is that this site is too sensitive for a convenience store or just about any other type of land use that could accidentally discharge a contaminant into the environment.

The real shame is that the water district will abandon this precious resource and pipe water at great expense to the area from a surface source.

Yes, Facility Siting Matters

Another case I know of involves a typical small mom and pop (except in this case, pop has a ponytail) variety store that sells gas. The store is located less than 1,000 feet from a major sand and gravel municipal water supply well.

For several years, the water district fought to prevent the construction of the store. Nevertheless, in the

early 1980s it came to be, decked out with a suction piping system and bare steel tanks. In 1990, MDEP staff inspected this site and found that piping under the pump island had been damaged, most likely as the result of a car running into the dispenser.

The investigation that followed found minor contamination around the fill pipe, but much more from leaky aboveground suction pumps. Again, the tanks and underground piping were not the problem. The problem was that the leaks could have been caught early through simple, routine inspection.

By the grace of Gaia, the water district had installed a monitoring well system as part of its wellhead protection plan. This system allowed MDEP instant access to groundwater data to help expedite its plan of attack. Thankfully, the story ended well, with only the fairy edge of the gasoline plume tickling the production well with low and ephemeral hits of MTBE—but at a cost of $600,000 to pay for a multiphase remediation system and two years of water piped in from the adjacent town

The Sermon

It's clear that some of these stations should never have been allowed to be built so close to major water supplies. Unfortunately, many towns and cities suffer from the all-consuming lust for property taxes, and we, the consumers, suffer from the insatiable need for convenience. We're such slaves to technology that we forget how far a little horse sense can go. No matter how good the storage technology, it is still true that an ounce of siting prevention is worth many hundreds of thousands of dollars of remediation.

In many cases, tank owners and operators think they can simply buy the convenience of compliance. But technology ain't all it's cracked up to be, and it is up to owners and operators to keep a vigilant eye on things. Large industrial plants go to great lengths to physically check and double-check processes that involve dangerous chemicals. Station owners, operators, and employees need to treat their facilities in much the same way, because gasoline is not potato chips—it is a dangerous chemical that is both toxic and flammable. ■

TIPS FOR TANK OWNERS AND OPERATORS

Maintaining a modern gas station is a team effort. Here are some timely tips for reducing your environmental impact.

Customers

- ✔ **Encourage customers not to top off their tanks. This will reduce the likelihood of spills that could cause fires and contaminate groundwater and surface water.**
- ✔ **Place signs on the dispenser, encouraging customers to report problems, such as slow flow, excessive vapors, and spills, to the attendant.**

Employees

- ✔ **Hold monthly environmental, health, and safety meetings to review emergency response protocols with employees.**
- ✔ **Be sure employees know the meaning of all environmental and fire alarms, the correct response, and the consequences for not reacting properly.**
- ✔ **Educate employees on the dangers of gasoline and other chemicals with which they come in contact at work. (OSHA law 1910.120, Hazardous Communications)**

Owner/Operators

- ✔ **Understand how your UST system works, and read the operation manual for your leak detection system.**
- ✔ **Make sure you know how much fuel you can actually put in your tanks. You must know at what liquid level your overfill prevention devices are activated. Do not order more fuel than a tank can hold!**
- ✔ **Walk your facility site once a day to look for obvious signs of discharges (e.g., strong vapor odor, distressed or dead vegetation).**
- ✔ **Inspect containment sumps and look under dispensers once a month.**

Tank and Pump Contractors

Once a year:

- ✔ **Test and calibrate all electronic leak detection devices per manufacturer's recommendations.**
- ✔ **Leak-test all containment sumps with water.**
- ✔ **Inspect all fire safety equipment (i.e., proper anchoring and operation of crash valves and hose breakaways). These devices prevent fuel from spilling from pressurized piping systems if the dispenser is hit or a customer drives off with the hose still in the tank.**
- ✔ **Physically check all leak detection probes for proper operation. Make sure float sensors in containment sumps work by either immersing them in water or employing some other method described in the operation manual.**
- ✔ **Physically inspect all overfill devices for proper operation (i.e., do they shut off or set off the alarm at the prescribed level?). This step includes extracting ball float valves to make sure the cage hasn't rusted away.**
- ✔ **Perform quantitative 3 gallon per hour leak tests on both mechanical and electronic line leak detectors. These devices are very important, because they are designed to guard against catastrophic releases.**

Fuel Delivery Drivers

- ✔ **Contract with your fuel delivery company to ensure that all spill buckets are free of product after delivery, so that excess product does not float out during a heavy rain.**
- ✔ **Be sure delivery drivers understand how your overfill prevention device works.**
- ✔ **Observe your driver during a delivery to make sure that he or she is meeting requirements.**